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(12) **EUROPEAN PATENT APPLICATION**

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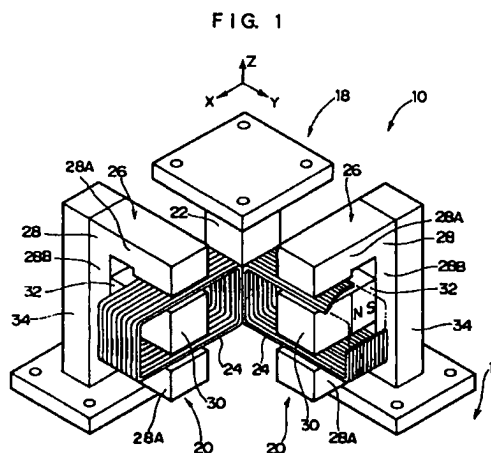
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Tokyo (JP)

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(54) **Vibration isolating apparatus and vibration isolating table**

(57) A vibration isolating apparatus and a vibration isolating table for reliably controlling vibration of an object of vibration isolation. A coil-mounting main body (18) is mounted on the vibration isolating table and a yoke-mounting main body (20) is mounted on a floor (14). A coil (24) of the coil-mounting main body (18) is disposed in a gap of a yoke (26) where magnetic flux passes through, in a state in which the coil does not contact the yoke. An acceleration sensor for detecting a vibration is mounted on the vibration isolating table and is connected to a controlling device. The controlling device receives an acceleration detecting signal from the acceleration sensor and controls an electric current applied to the coil (24) such that vibration acting on the vibration isolating table becomes zero. Since the coil (24) and the yoke (26) are disposed in a non-contact state, even though vibration shifted in any direction other than a direction in which the coil (24) moves is generated on the floor (14), the vibration is not transmitted to the vibration isolating table.



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## EUROPEAN SEARCH REPORT

Application Number  
EP 95 11 3893

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	EP-A-0 608 480 (FIRMA CARL FREUDENBERG) 3 August 1994 * column 6, line 21 - line 31; figure 1 * ---	1,2	H02K33/18 F16F15/03 H02K35/04
X	SOVIET INVENTIONS ILLUSTRATED Section PQ, Week 8650 24 December 1986 Derwent Publications Ltd., London, GB; Class Q63, AN 86330604 XP002010556 & SU-A-1 222 933 (FER MET WORK SAFETY) , 7 April 1986 * abstract * ---	1,2,19	
X	US-A-3 529 188 (J.W.GEARING) 15 September 1970 * figure 1 * ---	1,2	
A,D	PATENT ABSTRACTS OF JAPAN vol. 15, no. 225 (M-1122), 10 June 1991 & JP-A-03 066952 (HITACHI LTD), 22 March 1991, * abstract * ---	1,19	
X	US-A-4 976 415 (N.MURAI & AL.) 11 December 1990 * column 3, line 42 - line 47 * * column 3, line 56 - line 68 * * column 4, line 33 - line 42; figures 1,2,9 * ---	1,3,20	TECHNICAL FIELDS SEARCHED (Int.Cl.6) H02K F16F
A	DE-B-12 67 619 (FABRIQUES MOVADO & AL.) 2 May 1968 * column 3, line 63 - column 4, line 18; figures 1,3 * --- -/--	1,3,20	
<del>The present search report has been drawn up for all claims.</del>			
Place of search BERLIN		Date of completion of the search 9 August 1996	Examiner Leouffre, M
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	

EPO FORM 1503 (04.92) (P04C01)



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# EUROPEAN SEARCH REPORT

Application Number  
EP 95 11 3893

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	PATENT ABSTRACTS OF JAPAN vol. 11, no. 198 (E-519) [2645] , 25 June 1987 & JP-A-62 023357 (SHOWA ELECTRIC WIRE & CABLE CO. LTD.), 31 January 1987, * abstract *	1,3,20	
A	--- US-A-4 161 666 (T.J.BACSANYI & AL.) 17 July 1979 * figures 3,5 * -----	1,3,20	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
<del>The present search report has been drawn up for all claims.</del>			
Place of search BERLIN		Date of completion of the search 9 August 1996	Examiner Leouffre, M
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	

EPO FORM 150 (01.82) (P0401)



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EP 95113893

### CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ All claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for all claims.
- ☐ Only part of the claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claims:
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

### ☒ LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims 1,2,19: Vibration isolating apparatus based on the voice coil motor principle.
2. Claims 3,20: Bidirectional vibration isolating apparatus.
3. Claim 4: Coil shape.
4. Claims 5-8: Vibration isolating apparatus controlling means.
5. Claims 9-11: Voice coil apparatus as shown in fig. 1,2.
6. Claims 12-14: 2nd embodiment shown in fig. 3.
7. Claims 15,16: 3rd embodiment shown in fig. 5.
8. Claim 17: 4th embodiment shown in fig. 6.
9. Claim 18: 5th embodiment shown in fig. 7.

- ☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☒ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respects of which search fees have been paid, namely claims: 1,2,3,19,20
- ☐ None of the further search fees has been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

DERWENT-ACC-NO: 1996-141261

DERWENT-WEEK: 200238

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TITLE: Vibration isolating appts. e.g for precision optical  
instrument - comprises controlling device which controls  
electric current applied to coil so that vibration acting  
on vibration isolating table becomes zero

INVENTOR: MIYAZAKI, T

PATENT-ASSIGNEE: BRIDGESTONE CORP[BRID]

PRIORITY-DATA: 1994JP-0212647 (September 6, 1994) , 1994JP-0157497 (July 8,  
1994)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
EP 701314 A2	March 13, 1996	E	021	H02K 001/00
DE 69526164 E	May 8, 2002	N/A	000	H02K 033/18
JP 08074928 A	March 19, 1996	N/A	008	F16F 015/03
EP 701314 A3	October 30, 1996	N/A	000	H02K 001/00
US 5693990 A	December 2, 1997	N/A	020	F16F 015/03
EP 701314 B1	April 3, 2002	E	000	H02K 033/18

DESIGNATED-STATES: DE GB DE GB

CITED-DOCUMENTS: 3.Jnl.Ref; DE 1267619 ; EP 608480 ; JP 03066952 ; JP  
62023357  
; SU 1222933 ; US 3529188 ; US 4161666 ; US 4976415

APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO	APPL-DATE
EP 701314A2	N/A	1995EP-0113893	September 5, 1995
DE 69526164E	N/A	1995DE-0626164	September 5, 1995
DE 69526164E	N/A	1995EP-0113893	September 5, 1995
DE 69526164E	Based on	EP 701314	N/A
JP 08074928A	N/A	1994JP-0212647	September 6, 1994
EP 701314A3	N/A	1995EP-0113893	September 5, 1995
US 5693990A	N/A	1995US-0523137	September 5, 1995
EP 701314B1	N/A	1995EP-0113893	September 5, 1995

INT-CL (IPC): F16F015/02, F16F015/03 , H02K001/00 , H02K033/18 ,

H02K035/04

ABSTRACTED-PUB-NO: EP 701314A

**BASIC-ABSTRACT:**

The vibration isolation appts. has a magnetic force generator (24), a coil, with a gap allowing passage of magnetic flux in a direction intersecting the vibration direction. The generator is connected to either the site of vibration or the vibration receiving site. A conductor passes through the gap perpendicularly to the vibration and is separated from the generator.

The conductor is connected to either the vibration receiving site or the site of vibration, opposite to the generator. A control unit charges the conductor with an electric current to allow it to generate a force acting in a direction opposite to the vibration direction w.r.t. the magnetic force generator.

USE/ADVANTAGE - For electron microscope, precision balance, precision machine tool, and vibration isolating floor. Prevents vibration in predetermined direction and prevents vibration of any direction other than predetermined direction from being transmitted to object to be isolated. provides vibration isolation table with reliably controlled vibration.

ABSTRACTED-PUB-NO: EP 701314B

**EQUIVALENT-ABSTRACTS:**

The vibration isolation appts. has a magnetic force generator (24), a coil, with a gap allowing passage of magnetic flux in a direction intersecting the vibration direction. The generator is connected to either the site of vibration or the vibration receiving site. A conductor passes through the gap perpendicularly to the vibration and is separated from the generator.

The conductor is connected to either the vibration receiving site or the site of vibration, opposite to the generator. A control unit charges the conductor with an electric current to allow it to generate a force acting in a direction opposite to the vibration direction w.r.t. the magnetic force generator.

USE/ADVANTAGE - For electron microscope, precision balance, precision machine tool, and vibration isolating floor. Prevents vibration in predetermined direction and prevents vibration of any direction other than predetermined direction from being transmitted to object to be isolated. provides vibration isolation table with reliably controlled vibration.

US 5693990A

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The conductor is connected to either the vibration receiving site or the site of vibration, opposite to the generator. A control unit charges the conductor with an electric current to allow it to generate a force acting in a direction opposite to the vibration direction w.r.t. the magnetic force generator.

USE/ADVANTAGE - For electron microscope, precision balance, precision machine tool, and vibration isolating floor. Prevents vibration in predetermined direction and prevents vibration of any direction other than predetermined direction from being transmitted to object to be isolated. provides vibration isolation table with reliably controlled vibration.

CHOSEN-DRAWING: Dwg.1/13 Dwg.1/13

TITLE-TERMS: VIBRATION ISOLATE APPARATUS PRECISION OPTICAL  
INSTRUMENT COMPRISE  
CONTROL DEVICE CONTROL ELECTRIC CURRENT APPLY COIL SO  
VIBRATION ACT  
VIBRATION ISOLATE TABLE ZERO

DERWENT-CLASS: Q63 V06

EPI-CODES: V06-M07; V06-M08; V06-M20;

SECONDARY-ACC-NO:

Non-CPI Secondary Accession Numbers: N1996-301074